NAVIGATION.

STAGE OF WATER IN RIVERS.

The rivers continued low during September. In the Mississippi the highest stages were recorded from the 1st to 4th, at all points north of New Orleans, Louisiana; at that station it was highest on the 30th. The lowest stages occurred during the latter part of the month, except at New Orleans, where it was lowest on the 1st.

The Ohio river fell to one inch above low-water mark on the 16th, at Pittsburgh, Pennsylvania, and was very low throughout its course the entire month.

In the Missouri river the highest water was observed on the 1st and 2d, and the lowest at the end of the month.

At Nashville, Tennessee, the Cumberland river was closed to navigation on account of low-water during the whole month.

The highest and lowest stages of water observed at the Signal Service stations during September, 1883, are shown in the following table:

Heights of rivers above low-water mark, September, 1883.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.	
		Date.	Height.	Date.	Height.
Red River:	Ft. In.		Ft. In.		Ft. In.
Shreveport, La	29 9				
Arkansas:					
Little Rock, Ark*	30 0	27, 28	4 8	11	2 8
Fort Smith, Ark		18	3 0	23	1 2
Missouri:					
Yankton, Dakota	20 0	1, 2	2 2	29, 30	1 0
Omaha, Nebr	16 0	2	7 7	29, 30	5 1
Leavenworth, Kans	21 0	1	8 11	21, 23, 24	6 4
Mississippi:					
Saint Paul, Minn	14 6	4	2 3	16, 30	1 6
La Crosse, Wis	18 0	1	1 11	20	1 0
Dubuque, Iowa	21 10	1	4 10	22	3 3
Davenport, Iowa	15 0	1	3 4	18, 23	2 0
Keokuk, Iowa	14 6	3	3 8	26, 27	2 2
Saint Louis, Mo	30 0	1	11 0	28, 29, 30	7 0
Cairo, Ill	40 0	1	10 5	30	4 8
Memphis, Tenn	34 0	1	8 2	30	2 4
Vicksburg, Miss‡	41 0	1	13 8	30	3 5
New Orleans, La†	—2 6	30	13 1	1	11 5
Ohio:					
Pittsburg, Pa	20 0	1	1 9	16	0 1
Cincinnati, Ohio	50 0	30	5 9	20	3 7
Louisville, Ky	24 0	1, 2, 3	4 3	24, 25	3 1
Cumberland:					
Nashville, Tenn	42 0	1	1 6	18, 19, 20	0 5
Tennessee:					
Chattanooga, Tenn	33 0	28	2 6	19	0 0
Monongahela:					
Pittsburg, Pa	29 0	1	1 9	16	0 1
Savannah:					
Augusta, Ga	30 0	27	5 8	16	3 10
Willamette:					
Portland, Oreg		2	4 1	26	1 0
Sacramento:					
Red Bluff, Cal		30	0 7	1	0 6
Sacramento, Cal		2	6 9	28	6 6
Mobile:					
Mobile, Ala		15	17 7	21, 24	15 4
Colorado:					
Yuma, Arizona		1	16 10	30	14 9

* The zero of river gauge was raised nine inches on the 22d, and readings corrected to same level for entire month. † Below high-water marks of 1874 and 1883. ‡ No observations on 6th and 7th. Gauge broken.

FLOODS.

Laredo, Texas.—The rain storm of the 4th and 5th was the heaviest that has been experienced here for a number of years. On the morning of the 5th about one-half of the city was covered with water. The walls of a large brick building erected for the Laredo water-works, were badly damaged. Trains from San Antonio and Corpus Christi were delayed on account of the washing away of bridges. The Rio Grande river rose seven feet in five hours on the 5th, and it continued to rise until noon of the 6th, when it had risen eighteen feet. Washouts occurred on the International and Texas-Mexican railways. Several houses on the Mexican side of the Rio Grande river were inundated on the 6th, and a large part of the Mexican National railroad bridge across the Rio Grande was washed away.

Reports from Corpus Christi on the 10th state that the recent rains caused all of the creeks west of that place, which had been dry during the entire summer, to rise to depths from twenty to forty feet. Large numbers of horses, cattle, and sheep were swept away by the strong currents and were drowned. The Texas-Mexican railway lost eleven bridges and culverts, and several miles of railroad track between Corpus Christi and Laredo. On one section of the Texas-Mexican road, near Pena station, five bridges and one and one-half miles of the road-bed were washed away. At San Diego, Duval county, a bridge four hundred and fifty-six feet in length was washed away, and also another large bridge over the Salado river in Mexico. At Magultaras station, on the Texas-Mexican railroad, about 1,100 sheep were drowned. On the 9th the Rio Grande had fallen to within a few feet of its former level.

HIGH TIDES.

Portsmouth, North Carolina, 11th.—Very high tide; island submerged one foot. High tide also on the 9th and 10th.

Sloop Point, North Carolina, 8th to 11th, 13th, 19th, 20th.

Cape Lookout, North Carolina, 11th, 20th, 21st.

Cedar Keys, Florida, 18th.

Block Island, Rhode Island, 21st.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for September, 1883, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 87.61 per cent. The percentages for the four elements are: weather, 87.70; direction of the wind, 85.13; temperature, 87.43; barometer, 90.36 per cent. By geographical districts they are: For New England, 87.50; middle Atlantic states, 89.38; south Atlantic states, 85.89; eastern Gulf, 86.43; western Gulf, 88.59; lower lakes, 87.99; upper lakes, 84.55; Ohio valley and Tennessee, 92.10; upper Mississippi valley, 87.22; Missouri valley, 85.13; north Pacific, 86.54; middle Pacific, 93.97; south Pacific, 98.21.

There were one hundred and twenty-six omissions to predict out of 3,690, or 3.41 per cent. Of the 3,564 predictions that have been made, one hundred and six, or 2.79 per cent., are considered to have entirely failed; seventy-five, or 2.10 per cent. were one-fourth verified; four hundred and twenty, or 11.79 per cent. were one-half verified; two hundred and seventy-eight, or 7.80 per cent., were three-fourths verified; 2,685, or 75.34 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During September, 1883, one hundred and nineteen cautionary signals were displayed. Of these, ninety-six, or 80.7 per cent., were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. Eleven cautionary off-shore signals were displayed, of which five, or 45.5 per cent., were fully justified; nine, or 81.8 per cent., were justified as to velocity only; and two were not justified either as to direction or velocity. One hundred and thirty signals, of all kinds, were displayed, of which one hundred and one, or 77.7 per cent., were fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Seven signals were ordered late.

Eighty-three winds of twenty-five miles, or more, per hour were reported, for which no signals were ordered. Many of these were high local winds or strong sea-breezes.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at the Signal Service stations, during September, 1883, with average depth at which the observations were made, are given in the table below. The highest water temperature recorded during the month, 89°.1, occurred at Charleston, South Carolina; and the lowest, 47°.3, occurred at Alpena, Michigan. The largest monthly ranges are: Alpena, Michigan, 18°.4; Chincoteague, Virginia, 15°; Grand Haven, Michigan, 14°.5; Smithville, North Carolina, 13°.9; Fort Macon, North Carolina, 13°.5; Toledo, Ohio, 13°4; Galveston, Texas, 13°. The smallest

monthly ranges are: Eastport, Maine, 2°.4; San Francisco, California, 3°.3; and 5° at Jacksonville, Florida, New London, Connecticut, and Provincetown, Massachusetts.

Temperature of Water for September, 1883.

STATION.	Temperature at bottom. Max.	Temperature at bottom. Min.	Range.	Average depth, feet and inches. ft.	Average depth, feet and inches. in.	Mean temperature of the air at station.
	°	°				°
Atlantic City, New Jersey	70.7	64.5	6.2	3	6	65.1
Alpena, Michigan	65.7	47.3	18.4	12	6	52.8
Augusta, Georgia	85.0	74.0	11.0	4	6	73.8
Baltimore, Maryland	75.0	66.0	9.0	10	0	65.1
Block Island, Rhode Island	66.5	58.9	7.6	8	6	61.5
Boston, Massachusetts	62.8	60.5	2.3	21	6	59.3
Buffalo, New York	69.3	57.0	12.3	10	4	57.5
Cedar Keys, Florida	89.1	78.5	10.6	11	3	79.9
Charleston, South Carolina	81.6	72.1	9.5	41	0	74.3
Chicago, Illinois	67.7	58.0	9.7	8	6	60.7
Chincoteague, Virginia	79.0	64.0	15.0	5	9	67.5
Cleveland, Ohio	70.5	60.8	9.7	14	0	59.5
Detroit, Michigan	70.0	58.8	11.2	23	2	59.7
Delaware Breakwater, Delaware	72.2	65.3	6.9	8	6	66.7
Duluth, Minnesota	59.3	50.1	9.2	15	5	54.6
Eastport, Maine	50.9	48.5	2.4	15	11	55.3
Escanaba, Michigan	64.0	53.0	11.0	16	7	53.3
Galveston, Texas	85.0	72.0	13.0	11	1	79.3
Grand Haven, Michigan	71.6	57.1	14.5	19	0	57.0
Indianola, Texas	86.5	73.6	12.9	8	7	78.2
Jacksonville, Florida	84.0	79.0	5.0	18	0	76.5
Key West, Florida	88.8	83.0	5.8	17	8	82.9
Mackinaw City, Michigan	64.7	54.3	10.4	12	0	54.2
Fort Macon, North Carolina	82.5	69.0	13.5	8	5	72.8
Marquette, Michigan	58.0	49.0	9.0	9	10	53.9
*Milwaukee, Wisconsin	64.4	56.0	8.4	8	0	56.9
Mobile, Alabama	89.0	79.5	9.5	16	4	77.9
New Haven, Connecticut	69.7	61.4	8.3	15	1	60.1
New London, Connecticut	68.0	63.0	5.0	13	3	61.1
New York City	70.6	63.8	6.8	17	4	63.1
‡Norfolk, Virginia	75.1	66.9	8.2	17	7	70.5
Pensacola, Florida	84.7	77.2	7.5	17	2	77.2
Portland, Maine	57.8	52.5	5.3	18	3	59.2
Portland, Oregon	61.6	56.3	5.3	55	6	61.2
Provincetown, Massachusetts	64.0	59.0	5.0	12	2	60.8
Sandusky, Ohio	70.0	57.3	12.7	10	11	61.2
Sandy Hook, New Jersey	69.4	63.5	5.9	2	0	64.3
San Francisco, California	61.5	58.2	3.3	39	2	62.1
Savannah, Georgia	81.3	75.8	5.5	11	10	74.8
Smithville, North Carolina	83.3	69.4	13.9	10	0	72.4
Toledo, Ohio	73.7	60.3	13.4	12	3	60.6
Wilmington, North Carolina	79.6	69.0	10.6	2	3	72.1

*No observations taken from 8th to 26th, inclusive. Instrument broken.
‡No observations taken from 19th to 23d, inclusive. Instrument broken.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were frequent during the month. Those of the nights of the 15th and 16th were the most extensively observed. The various displays have been reported, as follows:

Duluth, Minnesota, 2d: an auroral display was observed here from 8.30 to 11.30 p. m. It consisted of pale yellow light, with luminous beams, reaching an altitude of from twenty to thirty degrees above the horizon.

Saint Vincent, Minnesota, 2d: A faint auroral light was visible here from 8 p. m. to midnight.

Escanaba, Michigan, 2d: Aurora from 9 to 11 p. m., first appearing as a pale green light and later assuming the form of a double arch.

Eastport, Maine, 2d: A brilliant aurora, of pale yellow color, was observed from 7.30 p. m. to midnight. Faint streamers appeared between 7.50 and 8.20 p. m.

This display was also noted at Traverse City and Lansing, Michigan; Embarrass, Wisconsin, and at Gardiner, Maine.

Mackinaw City, Michigan, 3d: a brilliant auroral display was observed at 8.25 p. m., extending across the heavens from east to west. The display faded away at 9.50 p. m., and reappeared at 10.10 p. m., finally disappearing at 11.20 p. m.

On the 4th a faint display was observed at numerous points from Dakota eastward to Michigan. It was also observed as a faint display at Cambridge, Massachusetts.

On the 5th an auroral display was quite generally observed in New England and the lake region; it was observed as far westward as northern Dakota; the most southerly station reporting it was Moorestown, New Jersey.

Wentworth, Dakota, on the 7th.

Johnson, Nebraska, on the 8th.

Polo, Illinois, on the 9th and 10th.

Saint Vincent, Minnesota, 13th.

On the 15th, a display was reported by numerous stations in Montana; the limits of observation extending eastward to Dakota, westward to Washington Territory, and southward to Cheyenne, Wyoming.

At Helena, Montana, it was observed at 9 p. m., as a diffuse light, which gradually extended and increased in brilliancy until a complete corona was formed. The display ended at 9.40 p. m.

The display of the 16th was observed at scattering stations from the north Pacific coast to the lake region.

At Fort Canby, Washington Territory, it was observed at 7.45 p. m., consisting of three dark-red slender columns, gradually decreasing in brilliancy until 9 p. m., when they disappeared.

At Fort Maginnis, Montana, the auroral beams extended to the zenith.

Milwaukee, Wisconsin, 16th: at 7.30 p. m. an auroral light of pale straw color covered the northern sky with beams extending to an altitude of 85°.

Marquette, Michigan, 16th: a brilliant aurora was observed here at 7.10 p. m., consisting of luminous waves of light shooting up from every part of the northern sky, forming a perfect corona, which continued a few minutes, when it spread over the sky. The colors were varied and very beautiful. The display ended at 9.20 p. m.

Other auroral displays were reported by the following stations:

18th.—Fort Buford, Dakota; Saint Vincent, Minnesota; and Holton, Kansas.

21st.—Milwaukee, Wisconsin.

22d.—Fort Totten, Dakota.

23d.—Chambersburg, Pennsylvania.

24th.—Fort Buford, Bismarck, and Alexandria, Dakota; and Wilkesbarre, Pennsylvania.

25th.—Eastport, Maine; Point Judith, Rhode Island; Cleveland, Ohio; Alpena, Escanaba, and Traverse City, Michigan; Polo and Riley, Illinois; Dubuque, Iowa; Wentworth and Fort Totten, Dakota.

26th.—Escanaba, Michigan; Toledo, Ohio; Wentworth, Dakota; and Saint George's, Delaware.

THUNDER-STORMS.

Thunder-storms were reported in the various districts on the following dates:

New England.—12th, 17th, 18th, 24th, 27th to 30th.

Middle Atlantic states.—2d, 4th, 5th, 12th, 15th, 17th, 18th, 24th, 28th, 29th, 30th.

South Atlantic states.—3d, 4th, 5th, 10th, 13th to 19th, 23d, 24th, 27th, 30th.

Florida peninsula.—1st to 4th, 6th, 7th, 8th, 17th, 18th, 20th, 21st, 25th, 29th.

Eastern Gulf.—4th, 12th, 13th, 15th, 16th, 17th, 20th, 22d, 29th.

Western Gulf.—2d to 8th, 14th, 15th, 16th, 20th, 29th, 30th.

Tennessee.—2d to 5th, 9th, 16th, 18th to 23d, 30th.

Ohio valley.—2d, 3d, 4th, 7th, 8th, 16th, 19th to 24th, 28th, 29th, 30th.

Lower lakes.—2d, 4th, 16th, 20th to 24th, 29th, 30th.

Upper lakes.—1st, 4th, 6th, 7th, 9th, 15th, 16th, 20th to 24th, 27th, 28th, 29th.

Upper Mississippi valley.—1st, 2d, 4th to 8th, 10th, 13th, 15th, 16th, 20th, 22d, 23d, 24th, 29th, 30th.

Missouri valley.—1st, 5th, 6th, 7th, 10th, 12th to 15th, 18th, 19th, 20th, 23d, 29th, 30th.

Northern slope.—1st, 3d, 4th, 5th, 7th, 9th, 11th, 12th, 13th, 19th.

Middle slope.—1st to 9th, 12th to 15th, 17th, 18th, 21st, 30th.

Southern slope.—4th, 5th, 8th, 11th, 13th, 16th, 19th, 29th, 30th.

Southern plateau.—6th to 9th, 11th, 18th, 19th, 27th, 28th, 29th.